

23 November 1955

**BAIRD ASSOCIATES**  
**PROGRAM DESIGNATIONS**

- I Remote viewing -- manual control sextant.
- II Remote viewing -- manual control sextant with provision for viewing sun's disc on ground glass with high magnification.
- III Remote viewing -- automatic sun sextant with photographic observation of sun's disc.
- IV Large aperture sextant to see stars in the daytime.
- V Large aperture sextant for daytime stars with rotation device for direct longitude determination.

**Baird Associates Proposes:**

- A. Initiate Program I as of now.
- B. Authorize further investigation including the feasibility of seeing stars in daytime.
- C. Outcome of study in B above would determine whether future work followed lines of II and III or IV and V.

**Financial:**

Baird Associates originally had  which has been spent. We propose:

25X1A

1. Original contract be extended to 1 December 1955 with increase in funds of  and,

2. New contract starting 1 December 1955 be negotiated allowing for Program I plus further investigations (at rate of  total for three months).

25X1A

**NOTE:** If more than one construction program is running concurrently, the delivery times will have to be increased somewhat.

**PROGRAM I -- Remote Viewing -- Manual Control Sextant**

- A.** Two-inch aperture with unit magnification -- two-inch diameter exit pupil -- twenty-inch eye relief.
- B.** Bubble for vertical determination projected into field of view.
- C.** De-rotation prisms in system so up-down motion on screen corresponds to "elevation"; right-left motion on screen corresponds to "azimuth."
- D.** Both azimuth and elevation controlled with hand knobs and with Veeder dials for reading data.
- E.** Could incorporate "averages" from Kollsman sextant if desired.
- F.** All equipment located forward of "periscope" and under windshield.
- G.** Small dome protruding in front of windshield would allow for viewing entire hemisphere except cone toward tail.
- H.** Weight between 10 to 20 pounds. Power requirement for lights only.
- I.** Data presented through periscope viewer by use of "flipping" mirror.
  - 1.** Can be used for "fighter celestial" navigation and making "landfalls" by day.
  - 2.** Can be used for all ordinary celestial techniques at night.
  - 3.** Mostlike present Air Force equipment and procedures -- requires minimum of training.
  - 4.** Can be operated from sitting position with pressure suit mask on.

- 3 -

- a. Simplest and quickest to build -- uses only known and proven techniques.
- b. Cost is estimated at  to design and build.
- c. Delivery is estimated at five weeks from date of initiation.

25X1A

**PROGRAM II -- Sun Viewing -- Manual Control Sextant**

A. -G. This would be a remote viewing-remote control sextant with features A through G of Program I and with addition of the following:

- H. An auxiliary high magnification system would be used which would provide for viewing an enlarged image of the sun on a ground glass screen in order to determine disc orientation by observing sunspots in visible light. This high magnification system would be put in or out of sextant at will.
- I. Disc rotation would be measured with respect to airframe and corrected for deviation from vertical by observing calibrated bubble.
- J. Would require special analog computer or new computational procedures for reducing sun disc data.

1. -4. Would have same uses and advantages as in 1 through 4 of Program I with the following:

5. Ability to obtain daytime fix using sun-disc data.

- a. Depends on visible sunspots for daytime fixes. Slightly more complex and difficult to build than Program I.
- b. Cost is estimated at
- c. Delivery is estimated at six weeks from date of initiation.

25X1A

**SECRET**

**SECRET**  
- 4 -

**PROGRAM III -- Automatic Sextant with Photographic Observation of Sun's Disc**

- A. Automatic sextant which searches for and tracks sun.**
- B. Sun's disc photographed in Calcium K light (3933 A°) with "Land" camera providing high contrast positive transparencies.**
- C. Sun's disc rotation obtained by comparison with "standard" picture in a viewing fixture.**
- D. Elevation and rotation data fed into analog computer or used with special computational technique to obtain fix.**
- E. Since equipment is essentially automatic, it can be remotely located.**
- F. Would require small observing dome which could be located aft of cockpit.**
- G. Might be used at night with stars or moon with additional complexity.**
  - 1. Will give "Solar" fixes during entire day. See G above for nighttime capability.**
  - 2. Requires essentially no effort on part of pilot other than obtaining picture rotation.**
  - 3. Will have electronic servo systems which will require maintenance.**
  - 4. Does not depend on presence of sunspots. Calcium clouds can be used for disc rotation.**
    - a. Most complex system -- requires developing computer and "Land" camera to work at high altitudes (low pressures).**
    - b. Cost is estimated at about  to design and build one.**
    - c. Delivery is estimated at eight weeks from initiation date (depends on success of development programs).**

25X1A

**SECRET**

~~SECRET~~

- 5 -

**PROGRAM IV -- Daytime Star Sextant**

- A. -G. This system would contain a manually operated sextant with features similar to those in A through G of Program I.
- H. Would contain auxiliary high magnification system for viewing stars in daytime. (Calculations show this should be feasible for altitudes above 40,000 feet with about 10x magnification).
- I. Presentation would be through periscope.
  - 1. -4. Would be used as in 1 through 4 of Program I.
  - 5. Daytime fixes could be obtained with stars. Would use "bright" stars at low altitudes (0 to 1 magnitude) and lesser stars (up to 3rd magnitude) at high altitude.
    - a. Construction should be simple and straight forward. Depends on outcome of feasibility tests.
    - b. Cost is estimated at  to design and build one.
    - c. Delivery is estimated at six weeks after initiation.

25X1A

**PROGRAM V -- Daytime Star Sextant for Use with Circumpolar Stars**

- A. -I. This system would have same features as in A through I of Program IV with additional:
  - J. Device to obtain longitude directly by observing rotation of Little Dipper about Polaris. Latitude obtained from Polaris.
- 1. -5. Same uses as in 1 through 5 of Program IV.
- 6. Direct latitude from Polaris.
- 7. Direct longitude from rotation of Little Dipper.
  - a. Construction slightly more complex than Program IV. Also depends on outcome of feasibility tests.
  - b. Cost is estimated at  to design and build one.
  - c. Delivery is estimated at seven weeks after initiation.

25X1A

~~SECRET~~